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HOFFMAN

ANTIQUITIES

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ANTIQUITIES

OF

NEW MEXICO AND ARIZONA.

BY

W. J. HOFFMAN, M. D., U. S. A.

From Proceedings of the Davenport Academy of Natural Sciences, Vol. III.
Read January 29th, 1880. Revised and printed April, 1881.

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DAVENPORT:
ACADEMY OF NATURAL SCIENCES.
May 2, 1881.

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Productus punctatus, Martin.
Productus prattenianus, Norwood.
Hemipronites crassus, Meek & Hayden
Spirifer opimus, Hall.
Athyris subtilita, Hall.
Bellerophon, sp.
Euomphalus, sp.
Orthoceras, sp.
Phillipsia, sp.

No traces of corals have been met with. The fossils consist of very sharp silicified casts and impressions in small stones of but few ounces weight, many of which appear to be somewhat water-worn, and often exhibiting a concretionary structure. These stones are brown on the outside, and of a light brown, cream or white color within, often partially of a porous chalky appearance.

Associated with them are numerous nodules of partially translucent finely granular quartz. In the latter no fossils ever occur.

January 29th, 1880.—Regular Meeting.

The President, W. H. Pratt, in the chair. Eleven persons present.

Messrs. D. R. Lillibridge and Noyes B. Miner were elected regular members. Dr. Shipp, Shipp's Landing, Tenn., was elected a corresponding member.

The President announced the following Standing Committees for the year:

Finance—C. E. Putnam, H. C. Fulton, R. D. Myers.

Publication—J. D. Putnam, C. C. Parry, W. H. Barris, R. J. Farquharson, C. H. Preston.

Library—C. T. Lindley, R. J. Farquharson, C. H. Preston, Miss Lucy Pratt.

Museum—W. O. Gronen, J. D. Putnam, C. C. Parry, J. Gass, W. H. Barris, C E. Harrison, D. S. Sheldon, Wm. Riepe, W. H. Pratt.

Furnishing—E. H. Hazen, E. P. Lynch, W. F. Ross.

Entertainments—Mrs. Mary L. D. Putnam, Mrs. J. B. Young, Mrs. E. M. Pratt, Mrs. W. O. Gronen, C. E. Harrison, C. T. Lindley.

Lectures—C. C. Parry, S. S. Hunting, R. D. Myers, Mrs. Mary L. D. Putnam.

Committee on Familiar Lessons—C. T. Lindley, C. H. Preston, C. C. Parry, J. D. Putnam, W. H. Pratt.

Committee on Cutting and Polishing Machines—C. E. Harrison, E. P. Lynch.

Committee on Chemical Apparatus—C. H. Preston.

Remarks on the Antiquities of New Mexico and Arizona.

BY W. J. HOFFMAN, M. D.

Of the several theories advanced regarding the origin of the modern Pueblo Indians of New Mexico and Arizona, the one more generally accepted, probably from lack of evidence to the contrary, is, that they are the descendants of that race who built and occupied the now ruined communal dwellings and cliff houses scattered over an area embracing more than thirty thousand square miles. Although in entertaining this view we must not lose sight of the discordant characteristics existing between the ancient and modern plans of architecture, which, upon close examination and comparison, appear to have been the result of necessity rather than of choice; and in presenting the facts, it may be well also to refer to the names by which we recognize these people of remote times, as they existed during the different periods of prosperity and misfortune.

The generic term "Pueblo"* has been adopted on account of their manner of living in community dwellings; with the specific word "ancient," applying to the builders of the ruined structures, while the term "modern" is retained for the present inhabitants. The "cliff-dwellers," so-called for want of a more appropriate name, formed that branch of the ancient Pueblos who constructed the cliff-dwellings for greater security against the hostile influences with which they appear to have been surrounded.

The oldest remains (of which there are some magnificent examples) include those of rectangular form, having terraced dwellings upon three sides, while the fourth—usually one of the longer ones—is filled up with lower structures, or stone walls, in which the latter sometimes deviate from a straight line. The two exceptions to the rectangular type are Pueblo Peñasca Blanca and Pueblo Bonito of the Chaco Cañon group, in both of which the habitable portions are semi-circular, the remaining continuation forming an oval, as in the former, and a straight line in the latter. In all, however, the structures were amphitheatral, *i.e.*, terraced from within outward, thus forming an inner court and causing the outer wall to be the highest, forming an effectual defense against surprise. On the contrary, we find the Pueblos of the modern Indians to be constructed in pyramidal form, the roof of the outer row of buildings being the lowest, forming the pavement for the second series, and so on upward to the most elevated point, so that, were it possible to invert one type over the other, they would almost fit. The *estufas*, or council rooms connected with the ancient buildings, are circular, while the modern ones are rectangular, with several exceptions,* which appear to have been ancient ones, but refitted so as to save the labor of digging, as they had been built underground in accordance with the custom of that period.

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* Signifies town, village; population, people.

The exactitude and neatness displayed in constructing walls, or sections of walls, with very small slabs of stone, is marvelous,† and this skill is detected in some of the better class of cliff-dwellings, where the foundations were based upon the smooth sloping rock as securely as if it formed part of the rock itself.

In many localities these primitive structures have become nearly entirely obliterated, presenting here and there but a heap of rubbish, fragments of pottery, or an occasional dressed stone. That the inhabitants of these communal dwellings were disturbed by some external hostile influence seems probable from the fact that they were obliged to desert them for places of greater security elsewhere. In some of the best preserved Pueblos we find vessels and other household utensils in such excellent condition as would scarcely be the case had a voluntary departure been made therefrom. Of what nation the enemy was composed, or from what direction the invasion, is unanswerable from our present state of information ; though, that the main point of attack was from the south seems evident from the fact that the cliff-remains are nearly all northward of the respective groups of pueblos to which they are most conveniently located.

The cliff-remains consist of large dwellings, fortresses and cave-houses; watch towers and circular enclosures, usually situated upon the summit of the cliffs, and semi-circular walls, the two termini of which run out to the edge of the escarpment and directly over the dwellings, affording communication with the level country above. That the distance from the buildings to the summit, or to the valleys below, is greater than could have been reached by the most ingenious contrivance made of wood is apparent, and it would be impossible to know definitely how their mode of communication was carried on but for the discovery of some pieces of rope and cords made of the fibre of the Yucca (*sp?*) and in several instances the remains of notches cut into the sloping rock below.

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* At Santo Domingo, N. M.

† For illustrations of this see Mr. W. H. Jackson's Report in the Tenth Ann. Rep. U. S. Geol. and Geog. Survey Terr. for 1876.

Agriculture was carried on, as we learn from the discovery of charred corn, as well as the ears, and also from the existence of large irrigating canals along the ridges flanking extensive valleys over which lie scattered hundreds of little hillocks, consisting of hard clay containing a sprinkling of broken pottery, which, no doubt, mark the sites of the temporary habitations of the agriculturalists. These settlements are found in favorable localities in close proximity to the cliff-dwellings, which formed their mutual resort for defense.

The face of a continuous escarpment filled with little houses as they exist in the Verde valley, containing but one or two openings each, present an appearance resembling the deserted nests of a colony of cliff-swallows rather than the abode of human beings.

One of the most singular selections for such buildings is a large circular depression known as Montezuma's Well, eight miles northeast of Camp Verde, A. T. For miles below, the valley of Beaver Creek contains the remnants of what was once a flourishing settlement, although the ruins all appear to have belonged to the cliff-dwellers, the Well forming the northern terminus of the series. This depression, or Well, is several hundred feet in diameter, about seventy feet deep, with vertical walls exposing horizontal strata of limestone, while about one-half of the bottom is covered with water, no bottom being reached with a seventy foot line. There is a border of dèbris lying around the base of the wall, over which there is a tolerable growth of cottonwood and sycamore trees, with an occasional cluster of grass and reeds along the shore line. A narrow tunnel was discovered at the base of the eastern wall, leading irregularly out to the bank of Beaver Creek, a total distance of about fifty feet. The excavation, forming what has been termed the Well, was undoubtedly formed through the solution of the limestone by the carbonic acid with which the water was charged, the tunnel at one time forming the outlet. The flow of water had ceased, no doubt, and was stationary as it is now, when the "ancient" people conceived the idea of building their temporary habitations in the niches and cavities in the face of the wall, the remains of which are still visible, and, in several instances, in excellent preservation. The oblong form of the Well, allowed the buildings to nearly face the center, thus affording an admirable prospect for the aboriginal gossip.

There is but a single path leading down to the bottom of the well, just broad enough to permit the descent of one individual at a time, passing between two small dwellings, each large enough to hold three or four persons comfortably, for the defense of this point. That the buildings were used for this purpose is apparent from the fact that each contains but one small window, facing the path, but about six or eight feet distant, the door being in the next wall, facing the opposite side of the Well, and only accessible by crawling along a narrow ledge.

One of the most interesting features existing in connection with many of the ruins is the excellent preservation of the wooden rafters and lintels. These consist mainly of cedar, and frequently bear the marks of the builder's stone axe; but when we consider the sheltered positions of the preserved specimens,* as well as the meager rainfall and extraordinarily dry atmosphere, this may be accounted for. We find the same to exist in exactly a like condition in the buried city of the Desert of Gobi, western China, which, on account of the encroachment of the sand was deserted already as early as the ninth century.

With our present state of information, no conclusions can be formed regarding the time of the occupation of these cliff-remains. The subject is just beginning to receive that attention and investigation necessary for the accumulation of all attainable facts, which, when once collected and classified, will present the history without further speculation. Although there appears to be an absence of traditions relating directly to the predecessors of the present inhabitants, there is but little doubt that some dimmed historic facts will yet be brought to light when the mythology is studied, a field than which no richer one is to be found among any aboriginal tribes.

It is evident that the cliff-dwellings were deserted upon the removal of that danger which compelled their previous construction, though many of them are not as old as is generally supposed. According to Vargas, the Pueblo of Hungo-Pavi was inhabited in the latter part of the 17th century. That pueblo is now in ruins, and forms one of the grand series in the Cañon of the Chaco, N. M., of which, also, Pueblo Bonito is one, to which reference is made elsewhere.*

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* In one of the cliff-dwellings, where the overhanging ledge projected sufficiently to prevent the entrance of rain, the accumulation of mortar, or plaster, and owl's dung amounted to over two feet in depth.

That a greater number of years has elapsed since the occupation of some of the ruined buildings is apparent in the physical features of the surrounding areas. The geological formations are of such a character as ordinarily support forests, and the presence of large dry water courses filled with sand, gravel, and round water-worn boulders, furnish evidence of a once well-watered region. With the disappearance of the forests, whether from fires, aided by the requirements of the people for architecture and fuel, or from other causes, the rainfall has decreased in proportion, so that little water, if any, remains in the cañons and valleys for any length of time, even after the most favorable season; and it is a fact well known, that since our first knowledge of the country, various sections of it have been undergoing a gradual process of desiccation. Extensive ruins occur at localities which are at this day fifty miles from the nearest spring, and in which the intervening water courses have become the bed of a growth of timber.

The modern Pueblo Indians appear to have no knowledge of the builders of the ruined dwellings with which they are surrounded, and since the earliest reports, the modern communities seem to have altered but little, though allowing their dwellings to present every indication of decay and neglect.†

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* Vargas names the Pueblo of La Cieneguilla. It is supposed to be between Santo Domingo and Santa Fé.. Ruins exist in the cañon of the river of Santa Fé, and these may be the remains of La Cieneguia, as it is sometimes spelled. Augustin Ruiz visited *Puara* in 1581, which is situated above Tegua (on the river). It is about eight miles above Albuquerque on the Del Norte, but it is long since in ruins. The Pueblo of the Galesteo, a village of the Tanos nation, [*sic*] is now also in ruins. This is situated two miles south of Santa Fé. [Extracted from Davis' Conquest of New Mexico. 1869.]

† It may be well to state in this connection that the Pimas have in several instances been named as being closely connected with the Pueblos on account of their comparative advancement in constructing their habitations. In this respect there is no similarity whatever, rather comparing with the former mode of building of the Mandans. In conversation with Dr. Willis De Haas upon this subject a short time since, he stated that the circular heaps of earth indicating the former site of a Pima house had been the means of suggesting the idea that the Mound Builders' remains (of a similar character though more extensive) in the Ohio Valley had once supported the habitations of the latter. In a communication from Dr. De Haas, dated Dec. 23d, 1879, he says, "Mr. Lewis H. Morgan (in a paper read before the National Acad. of Sci., April, 1876, and *N. A. Review*, July, 1876,) maintains that the mural works west and south were constructed for the support of houses; that the Mound Builders were Village Indians; that they lived in communities like the Pueblos and other southwest tribes. The article pub-

Then again, the discovery of human remains and relics of art, found at varying depths in the soil, present every indication of considerable age.

The most interesting discovery is that of a skull found several years since in the Chaco Cañon, N. M., fourteen feet below the surface.* The cañon is about 500 yards broad at the point under consideration, the bed consisting of alluvium. Ten large ruined pueblos are located in the valley occupying about ten miles from first to last. At the time of building there was a stream of water which has since disappeared, but has left a narrow deep channel, varying from six to sixteen feet in depth, exposing to view the horizontal strata of alluvial deposits composing the soil. Nearly opposite Pueblo Bonito the cut has exposed a stratum of gravel and broken pottery in which the skull was found. On the opposite side of the gorge, and above the

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lished in the *Review* is illustrated by cuts, showing how the houses might have been constructed, &c. 'Upon the crests of the walls were the sites of the houses.' He manifestly refers to the dwelling-places of the Pimos, Mandans, &c., and assumes that the Mound Builders constructed their mural works for identically similar purposes. He further maintains 'that the tribes who constructed the earthworks of the Ohio Valley were American Indians; no other assumption is tenable.' He refers to them as 'Village Indians,' and his fanciful picture of a restored village is odd enough."

"He describes the readiness with which a communal dwelling could be built—by inclining poles against the sides and securing them at the top. The house is divided into several rooms, to suit their communal customs; these apartments are occupied by separate families; a space for fire is arranged at intervals in a hall running the entire length, to accommodate the necessities of four apartments."

"In answer to this fallacious theory, it may be only necessary to say that, if true, we should be able to find at intervals in the embankments ashes, charcoal, kitchen refuse, etc. Not a single instance is upon record of such discovery where walls have been carefully taken down for economic uses, as at Marietta, Circleville, Columbus and elsewhere, where the material was used in manufacturing brick, &c. In some places the earthworks had been used for burial purposes, as at Fort Ancient."

The circular dwellings of the Pimas frequently, and as far as my personal observation extended, generally had an embankment of earth and sand piled around and against them, to strengthen the fundamental support. and to prevent the water from entering during rains, thus acting as a barrier. Should one of these houses be in any way destroyed, what would indicate its former existence? Nothing but a circular embankment, though less in extent than most of those of the Ohio Valley; but in them would exist the remains of a hearth, its accompaniment of charcoal, ashes, broken pottery, etc., etc. The same thing, on a still smaller scale, can be seen after the destruction of a hut belonging to a miner, or a charcoal burner; instances being common where mud and turf has been piled against the outside walls as high as the roof, and examples of which can be seen in a settlement of railroad builders most any time.

* Described and figured by the writer in the Tenth Ann. Rep. U. S. Geol. and Geog. Survey of the Terr. for 1876.

horizon of this stratum, are brought to view the remains of stone walls of older ruins, which terminate within four feet of the surface and are covered by undisturbed layers of sand as deposited by the periodical overflow; over all this now stands the long since deserted ruin of the pueblo above named.

Human remains were discovered by Mr. Chittenden*—late of Prof. Hayden's Survey—in the Hoven Weep, Colorado, four feet below the surface. Two other skeletons were also found near Abiquiu, N. M., twenty or thirty feet from an old ruin near the place where Dr. Yarrow made his discoveries. From recent information I learn of the existence of an ancient burial ground two miles from Camp Verde, A. T., near the site of my investigations in 1871. Capt. Brayton, U. S. A., stationed at that post about two years since, who, in making excavations for building stone over the site of an old ruin, found eight or nine partially burned skeletons lying side by side under the dèbris, their appearance and surroundings rather inducing the belief that they had fallen while defending the building; the supposition being strengthened by the fact that the older race did not practice cremation.

The Rev. Sheldon Jackson informs me that in October, 1878, a Mexican, in establishing a sheep ranch twelve miles north of Azul, N. M., discovered some pottery twelve feet below the surface while digging for water. At the depth named, a protruding shelf of rock was encountered, under which were found several vessels, only one of which escaped being broken by the pick and spade. These were found on the original surface of the soil, and near the site of an old spring which had long since been buried by the soil. The vessel was secured by Mr. Jackson, and is now in the National Museum. It represents a duck, has a capacity of less than a gallon, the opening being in the top of the neck, which is about an inch in diameter in the inside; color dark slate blue, with ornamentations in black, consisting of the usual black lines and serrated markings so common to all the older varieties. In several places there is considerable surface erosion, due to the moisture of the soil in which it lay buried.

It appears that in former times traffic had been carried on between some of the Pueblos and the Aztecs, but to what extent is not known. The Mexicans, besides employing several other species of *green stones* for ornaments and in the arts, had turquoises, which were, no doubt, obtained from the New Mexican mines, and for which articles of equal value were sent in return.* Amongst the debris of the older ruins we also find several species of marine shells which had been perforated and worked into pendants and for necklaces, indicating previous communication with the Pacific coast.

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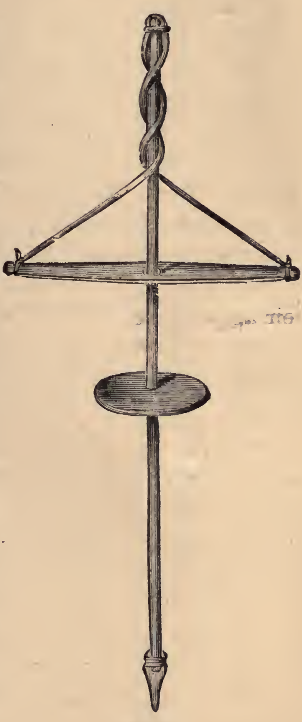
* Bull. U. S. Geolog. and Geograph. Survey, II, page 47. See also Rep. Chief of Engineers for 1875, p. 1066.

The turquoise found in New Mexico is usually of a pale bluish-green tint, though small specimens of a finer color sometimes occur. This mineral is still eagerly sought for by the inhabitants of the pueblos located nearest the old mines, and those fit for use are perforated by means of stone tipped drills, an illustration of which is given in Fig. 40827.

A writer in a recent number of the *Rocky Mountain Presbyterian* says "the Moqui received that name in 1855 on account of the ravages caused by an epidemic of small-pox which carried off nearly two-thirds of the population, this name being given them by their neighbors because it means *death*." The Aztec *miqui* signifies the same thing, and it is evident that the name was applied at a much earlier period, if applied at all, as Vargas, whose expedition set out for this region in 1692, employs the word Moqui in his narrative.



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* Coronado says of the Pueblos, "they have no cotton-wool growing, because the country is too cold, yet they wear mantles thereof, and true it is that there was found within their houses certain yarn made of cotton-wool." The payment of turquoises to Mexico is mentioned by Clavigero (Cullen's trans.) I, 351.

For further information regarding the green-stones used by the nation referred to, see article entitled "The Chalchihuitl of the Ancient Mexicans: its Locality and Association and its Identity with Turquois." By W. P. Blake. *Am. Jour. Sci. Arts*. XXV (2d ser.) 1858, pp. 227–232. Also, "Observations on the Chalchihuitl of Mexico and Central America." E. G. Squier. Ann. Lyc. Hist. N.Y., Vol. IX, 1869, p. 246–265, fig. 1. Mr. Squier doubts if the true chalchihuitl was turquois, and says that they [the Mexicans] used the stone described by Dr. Blake for certain purposes, for there exists in the museum of the late Mr. Henry Christy in London, a human skull completely encrusted with a

The Pueblo of Acoma is in precisely the same condition as noted three and a half centuries ago, while on the other hand, some towns appear to have since been deserted and in ruins.

As before stated, many of the modern dwellings are terraced from without toward a central elevation, in the form of an oblong truncated pyramid, being in this respect entirely the reverse of the ancient structures. The lower rooms are entered through the roof, which is reached from the outside by means of ladders, thus forming some defense against wild beasts, but no effectual one against the attack of an enemy. It appears from this mode of building, that, if they are the descendants of the cliff-dwellers, and through them of the "Ancient" Pueblos, the cause which led to the construction of fortified dwellings had been removed, and the consequent sense of comparative safety induced them to construct the modern dwellings, of the origin of which—regarding time—we have no historic data.

POTTERY.

In examining the oldest forms of pottery and fragments of vessels, one cannot but be surprised at the existence of glazing in greater or less degree upon the various types of specimens. By far the greater number of fragments bear color ornamentation upon a smooth surface, others being either perfectly plain or ornamented with indented or incised lines. The glazing upon some specimens is very pronounced, which extended investigations and chemical analyses appear to demonstrate was the result of accident rather than design.

Knowing the country to abound in springs and pools of water rather than running streams, and taking into consideration the general alkalinity of such water in this region, resulting from the disintegration of the rocks and the percolation of water through formations containing alkaline matter, and further the concentration of such solutions by evaporation—which is very rapid in this climate—it would be only natural for the natives to employ such water in the manufacture of pottery as would be unfit for any other purposes. Consequently, the water used in producing a plastic condition of the clay, with that ab-

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mosaic of precisely this stone, and a flint knife with its handle elaborately inlaid with it, in similar fragments. Various authors give *chalchiuitl*, *chalchihuitl*, or *chalchiuite*. The word *chalchiuitl* is defined by Molina in his *Vocabulario Mexicano* (1571), to signify *Esmeralda baja*, or an inferior kind of emerald. The precious emerald, or emerald proper, was called *quetzalitztli*, from *quetzal*—the bird *Trogan resplendens* (the feathers of which served for royal robes), and *itzli*—stone, *i. e.*, the stone of quetzal. The *esmeralda baja* is supposed to be nephrite, as Sahagun avers.

sorbed in smoothing the vessel previous to drying, would contribute sufficient saline matter to produce a visible effect, if the salt had not previously existed in the clay. In addition, it is ascertained that the salt is present in the body of the fragments of pottery as well as in the glazing, thus verifying to some extent the belief already entertained. Another fact which supports the statement is that in several instances glazing was present upon the incised or punctured varieties, and upon close examination was found to exist in the different indentations as well as upon the ordinary untouched surface. The reason that some specimens present more glazing than others, (and this, by the way, generally occurs upon the thickest fragments,) is, on account of the proportionately greater amount of saline matter contained therein, and brought to the surface as an incrustation by evaporation and drying, being thus directly exposed to the heat in baking, and also, perhaps, that these specimens may have received more surface washing to present a more uniform appearance.

Analyses made of a large number of varying specimens support the above proposition, and a few examples are given below, to illustrate the relative proportions of several ingredients that were more particularly sought for.

No. I. From a cliff-dwelling in the cañon of the Rio Mancos.

Physical characters: Compact; inner surface smooth and of a pale bluish or ashy tint; externally, fawn-colored, strongly glazed, the ornamentation consisting of black lines crossing the base lines at right angles. The body of the specimen contains numerous granules of silica and spicules of hornblende. Hardness, 3; sp. gr., 2.372.

Composition:	Chlorid of sodium,	.38
	Potassa,	.12
	Alumina,	.03
	Oxide of iron,	.78
	Carbonate of lime, silica, etc.,	98.69

Carefully removing the glazed surface from other pieces of the same vessel, the body of the material furnished the following:

Chlorid of sodium,	.26
Potassa,	.13
Alumina,	trace
Oxide of iron,	.76
Carbonate of lime, silica, etc.,	98.85

Small particles of the baked clay were lost by adhering to the glazed scales, if they may be so termed, as that surface was too thin to remove without affecting the material to which it adhered. Natural thickness of the piece, .27 of an inch.

No. II. From the same locality.

Physical characters : Compact; granular; color, dark blue; glazing upon the outer surface not so pronounced as in the preceding, although the inner surface shows it very perceptibly. Decoration upon outer surface consists of pale black serrated lines. Hardness, 3.5. Sp. gr., 2.433.

Composition :	Chlorid of sodium,	.23
	Potassa,	.16
	Alumina,	.08
	Oxide of iron,	.56
	Carbonate of lime, silica, etc.,	98.97

Thickness of specimen, .13 of an inch. In this case the vessel was, according to the pieces, about eight inches high, originally with an opening less than four inches in diameter, and would scarcely present the inner perceptibly glazed surface from intentional design in manufacture, for that were scarcely possible.

No. III. From Santo Domingo.

Physical characters. Rather porous; fawn-colored in middle of specimen, the inner and outer fourths being of a reddish tinge, due to oxidation of iron; no glazing; contains minute granules of silica; colored decorations, brown. Hardness, 2.8; sp. gr., 2.308.

Composition :	Chlorid of sodium,	.24
	Potassa,	.15
	Alumina,	.02
	Oxide of iron,	.15
	Carb. of lime, silica, org. matter, etc.,	99.44

If any glazing was present originally, it was not perceptible at this time, although no indications of wear were noticeble. The coloring matter upon this specimen consisted of carbonate of iron, and it would be interesting to know how long a period was consumed in the change from an oxide. Mortar from a Roman wall was found to contain carbonate of lime, and in another instance a bi-carbonate, the reunion of the carbonic acid with the lime having taken place during the lapse of centuries.* The black lines applied to this pottery are supposed to have consisted of charcoal finely ground and mixed with clay. Iron in the form of an earthy oxide is not of common occurrence in this region, and it may be that the material employed was from the "red ochre mines" mentioned by Vargas as being located in the Cierro Colorado, (Red Mountain). "It is said to be ten days travel from Aguatubi, on a high steep mountain, difficult of access. It required a day or two to go up and get the ochre out of the earth, having to descend into a deep hole, and that it was necessary to remain all night without water."* The narrator never made an expedition to the mines, the reported absence of water probably being the cause of his avoiding the dangers attending such an undertaking.

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* I was recently so informed by Dr. F. M. Endlich of the Smithsonian Institution, who has made analyses of the mortar above stated.

The ornamentation upon the pottery found about the ancient ruins, differs in design from that produced to-day, or even that style employed before the introduction of European or American ware, which suggested new forms and which has, in several instances, materially modified their primitive artistic taste. Upon the older vessels, straight lines and triangles predominate and form the base of nearly all varieties of decoration, while upon the true modern pottery curved lines are generally the most prominent. There are very decided differences in the decoration of the respective pueblos, which, to one thoroughly acquainted with them, can nearly always be distinguished; an attempt to exhibit this variation without the proper illustrations would be a useless undertaking at this time.

Pottery is manufactured at present by the inhabitants of all the Pueblos but those of Taos and Picuri, excepting in instances where a woman of the manufacturing tribes marries a Taos or Picuri Indian. The ordinary decorated ware is made by numerous tribes, but for the purpose of giving it a better finish, a polishing stone is used, giving the surface of the vessel a glazed appearance after baking. The clay employed in constructing the vessel, when of the proper consistence, is worked with the thumb and fingers, aided with a small wooden trowel or a fragment of pottery to shape the ware until of the intended proportions and shape. The vessel is then sun-dried, after which the ornamentation is applied, when it is baked. The Indians of the Moqui Pueblos, as well as those of Zuñi, Acoma, Laguna, Jemez, Silla and Santa Ana, do not employ polishing stones, but paint the pottery in various styles of decoration, each general type presenting sub-types characteristic of certain families or clans which are always recognizable by one intimately acquainted with them.†

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* Quoted at second hand from "Davis' Conq. of N. Mex." 1869.

† I am indebted to Col. James Stevenson for information regarding the present mode of manufacture of pottery by these Indians. During the past two seasons he has made a thorough study of the arts and home life of the aborigines of New Mexico, his collections now ready for permanent exhibition in the National Museum comprising 4,500 specimens of pottery, representing all imaginable forms, sizes and styles of decorations; also, about 3,000 archæological specimens of stone, wood and bone, 50 musical instruments, 150 articles of clothing, about 40 varieties of paints, earths and other

The black ware, first brought to the National Museum by Col. Stevenson, is made by the Indians of the Pueblos of San Juan, Santa Clara, San Ildefonso, Cochiti, Tesuque, Nambe, Santo Domingo, Sandia and San Filipe. The vessels are constructed in the ordinary manner and sun-dried. A paste of clay is then made, of the consistence of cream, and applied with a mop or brush of goat's hair or sheep's wool, which is then rubbed dry with the polishing stone. The vessel is next placed upon the ground, and a pile of dry manure built over it in contact with the specimen, appearing not unlike a huge bee-hive. The pile is ignited at several points about the base, and as soon as the fuel is consumed the ashes are quickly scraped away, when powdered manure is thrown upon the vessel, causing a dense smoke. The vessel, in this stage of sudden cooling, absorbs sufficient carbon to become perfectly black and glossy upon such parts as have been previously polished. The accompanying figures refer to some of the forms recently received by the National Museum:

Pl. V, Fig. 39695, represents a small flat eating dish. Although not one of the older forms in shape, it illustrates a very simple one for manufacture. Pl. II, Fig 39748, is a small water jar, and represents the most primitive form. In Pl. III, Fig. 39780, the neck appears, illustrating gradual improvement over the preceding. Pl. III, Fig. 39615, is a water jar with a handle, while in Pl. III, Fig. 39625, the handle is replaced by ears, admitting of suspension by cords. Pl. II, Fig. 39629, is grooved for the reception of a cord, to which others were attached either for carrying or suspension. Pl. III, Fig. 39650, presents both the groove and ears. Pl. II, Fig. 39832, is an odd form and represents a bird, while the grotesque object represented on Pl. II, Fig. 39824, is for no particular use, further than an exhibition of skill in the working of clay. Pl. III, Fig. 41053 is an unpolished black vessel used for cooking purposes.

The preceding are nearly all from the pueblo of Santa Clara, though they are typical of all those tribes already referred to. The contrast can be seen by comparing them with the following vessels from Zuñi:

Pl. V, Fig. 40317, and Pl. IV, Fig. 41609, are ordinary water jars, as is also Pl. II, Fig. 39510, though in this the constriction was made for attaching cords to aid either in carrying, or for suspension. Pl. IV, Fig. 40612, represents a condiment dish, the separate partitions being intended for salt, pep-

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materials employed in the manufacture of pottery, besides toys, images, sacred objects, pipes, medicines, food, etc., etc.

I also embrace this opportunity of returning my sincere thanks to Major J. W. Powell, U. S. Geologist and Director of the Bureau of Ethnology, for granting me the use of illustrations intended for his forthcoming Annual Report. The numbers employed are those corresponding with the specimens as labeled in the National Museum.

per, etc. Pl. IV, Fig. 39962, is an ordinary eating dish, the spoon used in connection with it being shown on Pl. IV, Fig. 40417. Pl. IV, Fig. 40399, is a pottery basket, used in religious ceremonies to hold meal or flour, which is sprinkled on the heads of the sacred dancers and objects buried during the services. Pl. V, Fig. 40731, is a mortar and ball used for grinding the pigments used in decorating pottery. Although the present Zuñis utilize these, the articles were found by them in the ancient ruins, and were made by the pre-historic people. Most of the existing stone implements and weapons are found in the ancient ruins and utilized if practicable; the more common examples being hammers, as illustrated on Pl. V, Figs. 42208 and 42337, and axes, of which a fine specimen is represented on Pl. V, Fig. 40560.

Of the tribes who manufacture the black ware, the Cochiti Indians also ornament certain vessels with black lines, using a vegetable material called *wacca*.

Those tribes who manufacture the gray ware, with red, brown, or black ornamentation, have in several instances departed from the original forms of outlines, adopting characters and flowers found upon china imported by Mexicans or Americans. Zuñi pottery is generally known by the representation of animal forms, a typical example being given in Pl. V, Fig. 40317.

Prof. F. W. Putnam,* in speaking of the glazed surface of the gray pottery, says: "The gray clay seems to contain a large amount of silicious material, which, on being subjected to a great heat, becomes slightly vitrified. The vessels made of the gray-colored clay have apparently received a thin wash of the same, upon which the black ornamentation was put before baking, and the intense heat to which they are afterward subjected has vitrified this thin layer of clay, which now appears like a slight glaze. The polish is probably due to the smoothing of the surface with a stone before the thin wash was applied, as is now done by the present Pueblo Indians and by several tribes in the United States and Mexico."

According to the personal observations of Col. Stevenson, the glaze is produced, not by the heat, as the fire never reaches that intensity to fuse silica, but [illegible] the polishing stone which is used in rubbing the thin wash until dry previous to baking; the decorations being applied just before the vessels are ready for the fire. Prof. Putnam's remarks are not applicable to the Zuñi pottery, as before stated, that tribe does not use the polishing stone; the In-

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* American Art Review for February, 1881, p. 153.

dians of San Ildefonso using it, though in the manner just described.

CRANIA.

Examinations and comparisons of the crania obtained in the southwestern portion of the United States and northern Mexico, show that apparently characteristic peculiarities exist in all of those found in or about the ancient buildings and ruins, which are not present in crania of the adjacent regions nor in those of the present inhabitants. In the comparatively small number of crania thus far preserved in collections,* this peculiarity consists first, in the general absence of the superciliary ridges, and second, the existence of a remarkably prominent nasal eminence.

Another striking feature observed (as far as my examinations have extended) in the cranial remains from both north and south of that portion of the Mexican boundary is the constant occurrence of deformity, to a greater or less degree. In one instance of occipito-parietal flattening, the pressure upon the facial portion of the skull was so great, indirectly, no doubt, as to throw one orbit three-tenths of an inch above the normal position, while the other was correspondingly below it, the remaining facial bones being distorted in proportion. In nearly all the specimens, however, the flattening appears more strongly directed to either one side or the other, while in a few it is vertical occipital. In most instances this deformation might be attributed to the natural pressure of the cradle board, but the occurrence of such extraordinary asymmetry indicates that pressure was also, in certain cases, applied by bandaging, whether for the purpose as practiced in Central America or not, can only be surmised.

As is well known, cranial deformation† is attributed to pressure produced by the cradle board ; by bandages across the forehead, or boards, to produce elongation as well as flattening ; posthumous distortion, in consequence of the combined influence of pressure and moisture ; and, as Dr. Humphrey Minchin states, naturally and congenitally deformed in consequence of obliteration by synostosis of some one of the sutures, the obliteration taking place during intra-uterine or early extra-uterine life and by presenting a point of resistance, causing the brain and with it the calvarial bones to be unduly developed in certain directions.

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* It is supposed that the Army Medical Museum at Washington, D. C., contains by far the largest collection of crania of the ancient Pueblos thus far collected by Government or private parties.

†The cradles, as constructed by the majority of our Indians of to-day, consist of a frame of wood, with a back, composed either of a piece of raw-hide or a network of thongs or cords of buckskin. As these substances are more or less yielding, the pressure is not so great as where a piece of board was used for the same purpose. "In Nicaragua," says Bancroft, "the heads of infants were flattened; the people believed that the custom had been originally introduced by the gods; that the compressed forehead was the sign of noble blood and the highest type of beauty; and, besides, that the head was thus better adapted to the carrying of burdens. In Yucatan, according to Landa, the same custom obtained. Four or five days after birth the child was laid with the face down on a bed and the head was compressed between two pieces of wood, one on the forehead and the other on the back of the head, the boards being kept in place for several days until the desired

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cranial conformation is effected. So great was the pressure that the child's skull was sometimes broken. * * Mr. Squier, following Fuentes' unpublished history, says that among the Quichés, Cakchiquels, and Zutugils, the back of the head was flattened by the practice of carrying infants tied closely to a straight board." Vol. ii, p. 731, 732.

The following references will be found of importance in further illustration of this subject, as well as noting the universality of the occurrence of asymetrical crania:

J.Atkin Meigs, (M. D.) Observations upon the Form of the Occiput in the various races of Men. < Proc. Acad. Nat. Sci. (Phila. Pa.,) 1860, p. 412 *et seq.*, and, by the same author, Description of a deformed fragmentary Human Skull found in an Ancient Quarry-Cave at Jerusalem. < Proc. Acad. Nat. Sci, 1859, p. 272.

On the Crania of the most Ancient Races of Man, Müller's Archiv. 1858, pp. 453, (By Prof. Schaaffhausen) is discussed and extended in the Nat. Hist. Review, 1861, pp. 155--176, pl. iv,v. [Compares cranial deformities between ancient Mexicans, Flatheads, and Europeans.]

Notes on the Distortions which present themselves in the Crania of the Ancient Britons. < Nat. Hist. Review, 1862, pp. 290–297, ill. 1–3.

Ueber asymmetrische Schädel. < Novara-Expedition. Anthropologischer theil, I abtheil., Wien, 1875, pp. 40–50, besides numerous notes throughout the work, giving measurements, etc.

Retzius: Present state of Ethnology in relation to the form of the human skull. < Ann. Rep. Smiths. Inst. for 1859. 1860, pp. 251–270.

Winslow: [Conformation particuliere du Crâne d'un Sauvage de l'Amérique septentrionale.] < Mém. de l'Acad. Roy. des Sci. pour l'année 1722. 1724, pp. 322–324, pl. 16.

[Isle aux Chiens, 78me degré de lat. et 310 on plus de long.]

Retzius: Cranier från Sandwichs-öarna och Oregon. < Öfvers. Kongl. Vetens.-Akad. Förhandl. för år 1847. 1848, pp. 31–36, 2 figures.

Retzius: Peruvianernas cranieform. < Öfvers. Kongl. Vetens.-Akad. Förhandl. för år 1848. 1849, pp. 140–147.

[Remarks upon the distinctive characteristics of the American races, etc.]

Crania Selecta ex Thesauris Anthropologicis Academiae Imperialis Petropolitanae. < Mém de l'Acad. St. Pétersb. vi sér. Sci. Nat. viii. 1859, pp. 241–268, pl. 1–16.

[Important as relating to Aleutians: description, origin, measurements of crania, etc.]

Baer: Nachrichten über die ethnographisch-craniologische Sammlung der Kaiserlichen Akademie der Wissenschaften zu St. Petersburg. < Bull. Classe Phys.-Math. Acad. St. Pétersb. xvii. 1859, pp. 177–211. [Extended remarks on classification, measurements, etc., and on crania from graves from N. W. America. Voyez aussi Gosse's Essai sur les déformations artif. du crâne. Paris, 1855; Morton's Crania Americana; and Blumenbach's Decas Craniorum.]

Malformation of the skull appears occasionally dependent also, upon Cretinism, which is usually preceded by degeneration of the thyroid gland—goitre. This has been particularly noticed in the moré elevated regions of Europe and Asia.* Hereditary syphilis is also claimed to have produced similar results, as M. Parrot found the remains of this disease upon crania of the ancient races of Peru and Bogota, which, he avers, caused the deformation.† Quatrefages cites Jourdanet's work as referring to the existence of syphilis in Mexico previous to the Conquest, and it is found by comparing the ancient Mexican sculptures, that cranial deformation existed, but this was produced artificially as a mark of distinction, as among the Central Americans. The Aztecs, however, are not known to have practiced this custom ; though if they did, the practice had limited adoption.

A curious statement is made by Sir Robert Schomburgh, of Indians which he found on the Orinoco whose heads were flattened by nature. He saw a child one hour after its birth which showed all the characteristics of the tribe, "and the flatness of its head, as compared with the heads of the other tribes, was remarkable."‡

The most prominent of our native tribes as having practiced head-flattening are the Flathead Indians of the northwest,‖ though Dr. Suckley states that they do not practice this custom (1855). The Natchez, Choctaws, and in fact nearly all of the tribes within the borders of the United States, at one time practiced this custom to a limited extent, if all the literature is to be relied upon. It is more probable, however, that the frequent discovery of crania, deformed unintentionally by means of the primitive cradle board, has given rise to these statements regarding many of the Indian tribes.

In the following table, representing measurements of some of the crania from the region under consideration, metrical measurements are employed, as most convenient for the greater number of ethnologists engaged in this study. The abbreviations are as follows: c. and c. c., for centimetres and cubic centimetres, respectively; cap., internal capacity, measured by No. 8 shot; L., the greatest longitudinal diameter, measured from the glabella to the most prominent part of the occiput; B., breadth between the points of the parietal bones widest apart; H., height, measured by calipers, from the middle of the anterior border of the foramen magnum to the most elevated point on the sagittal suture; I. f. m., index of foramen magnum; L. a., longitudinal arch; C., circumference, by tape measure, on a plain including the glabella, occiput and prominent lateral elevations; Z. d., zygomatic diameter; and F. a., facial angle.

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*See Ermines' Travels in Siberia, 1848, ii, p. 330; Saussure, Voyage dans les Alpes, 1786, iv; Ackermann, Ueber die Cretinen. Gotha, 1790; Foderé, Traité du Goitre et du crétinisme, a Paris, an vii.

† Les deformations craniennes causées par la Syphilis héréditaire. < Association Française pour l'avancement des Science. Compt. Rendus de la 6e Session. (Le Havre, 1877). 1878, pp. 665-674.

‡ Jour. Royal Geograph. Soc. xv, p. 53, 54.

‖ Ueber Abplattung des Schadels bei Amerik. Indianern. < Froriep's Notiz. 1841, Bd. 19, p. 40. Ueber die Indianer aus Columbiaflusse. < *Ibid.* 1843, Bd. xxv, 2 ill.

LOCALITY.	Cap.—c. c.	L.—mm.	B.—mm.	H.—mm.	I. f. m.	L. a.—mm.	C.—mm.	Z. d.—mm.	F. a.	Cephalic Index
1. Pueblo Mounds, Utah	1145	160	138	122	39	324	476	126	79°	86.20
2. “ “ “		160	145	143	36.9	355	484			90.62
3. “ “ “		168	145		38.7	354	506		76°	86.30
4. New Mexican Pueblos	1160	159	138	130	41	333	476		78°	86.79
5. “ “ “	1215	151	138			341	456	100	92°	91.39
6. “ “ “	1380	153	156	142	35	338	506	123	84°	101.96
7. “ “ “	1205	154	147	140	34	345	476	128		95.45
8. Chaco Cañon, N. M.		155	142			323	460			91.61
9. Mexican	1515	181	141	141	45	375	508	120	75°	77.90
10. “		170	138	130	41	346	486	122		81.17
11. “	1260	179	135	138	42	368	498		79°	75.41
12. “	1455	181	147	127	47	365	519	131	80°	81.21
13. “	1220	164	145	121	41	342	485	124	79°	89.02
14. Arizona	1410	161	141	143	41.6		484	129	76°	87.57
15. “		155	138	145	35.5	340	460		72°	89.67

Nos. 1–3. From the southern portion of Utah. The mounds located in this region are supposed to have been built by the Pueblo Indians.

No. 4. Shows flattening over the left occipito-parietal region. From Laguna, N. M.

No. 5. Cranium of an “ancient” Pueblo from New Mexico, exhibiting marked flattening over the occipito-parietal region to the left of the median line, the deformation extending nearly as far as the temporal bone.

No. 6. Similar to preceding as to apparent age and locality. The occiput is nearly vertical in this specimen, the posterior portions of the parietal bones being included in the deformation, the pressure having been directed more to the left of the median line.

No. 7. Presents flattening over the left occipital region, giving greater rotundity and prominence to the parietal bone of the same side.

No. 9. Cranium of a Mexican Indian taken from the church of San José, near San Antonio, Texas. Superciliary ridges pronounced; occipital bone remarkably prominent and projecting, with no presence of deformity by artificial means.

No. 10. Skull of a Mexican assassin, from the vicinity of Matamoras. Superciliary ridges less prominent than usually found in Mexican Indians. No deformation.

No. 11. Nasal eminence rather marked; no deformation beyond slight flattening over the superior portion of the occipital bone to the right of the median line.

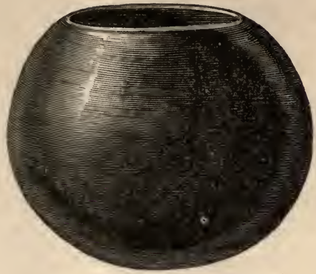
No. 13. Cranium of adult Mexican, female, showing slight flattening over the anterior superior apex of the occipital bone and adjacent portions of both parietals.

Nos. 14, 15. Both specimens were obtained in a ruined cliff-dwelling several miles northeast of Camp Verdé, A. T. Several skeletons were lying side by side, buried under the fallen wall, as if death had occurred in defense of the place; the greater portions of the bodies were destroyed by fire as the surroundings plainly indicated, the crania and few of the adjacent portions only being preserved.

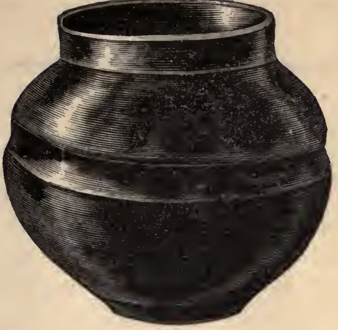
No. 8. This very deformed skull, already noticed, presents great occipito-parietal flattening, more to the left of the median line than upon the opposite side, producing remarkable prominence of the frontal bone. The measurements, as far as could be taken on account of partial fracture in transportation, are as follows:

Length,	155	mm.	Frontal arch,	295	mm.
Breadth,	142	"	Parietal arch,	?	
Longitudinal arch,	323	"	Occipital arch,	223	"
Circumference,	460	"	Length of Frontal,	108	"
Index For. mag.,	?		Length of Parietal,	124	"
Zygomatic diam.,	?		Length of Occipital,	163	"
Facial angle,	?		Cephalic index,	96.61	"

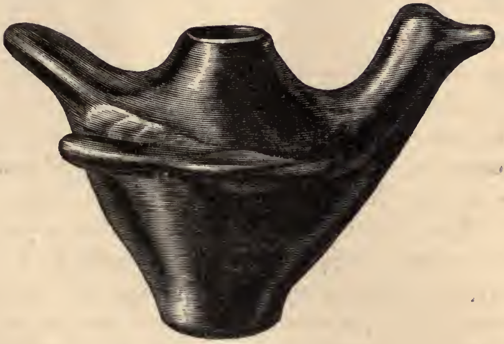
The effect upon the cephalic index by distortion is strikingly illustrated in Nos. 6 and 7, respectively, viz. 101.96 and 95.45. To these may be added another, from a cliff-dwelling in Arizona, having an index of 101.96. The number of crania from these interesting regions are very limited, and until more material is accessible no results of a satisfactory nature can be arrived at, the average of measurements blending one known type with another, and it is impossible to state whether the peculiarities previously referred to will result as characteristics of the so-called ancient Pueblos, or not.



39748
(⅓)



39629
(½)



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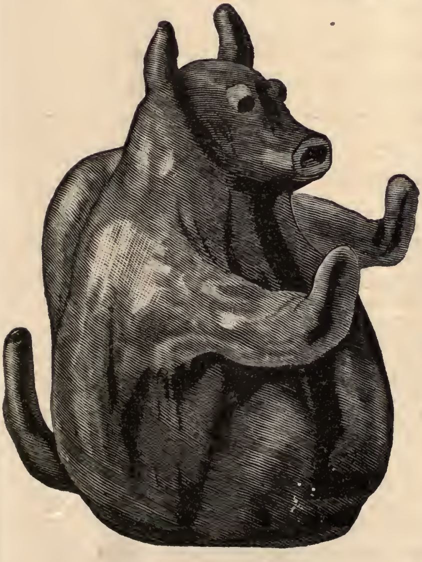
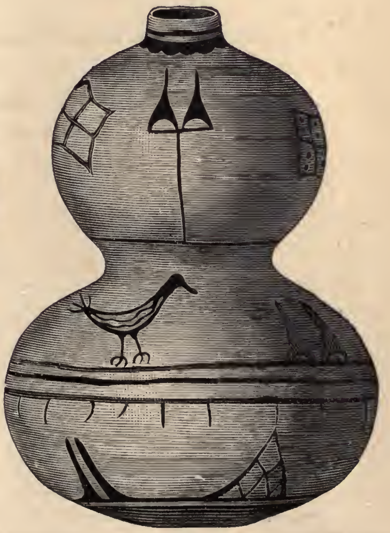
(½)



39824
(½)



39510
⅓

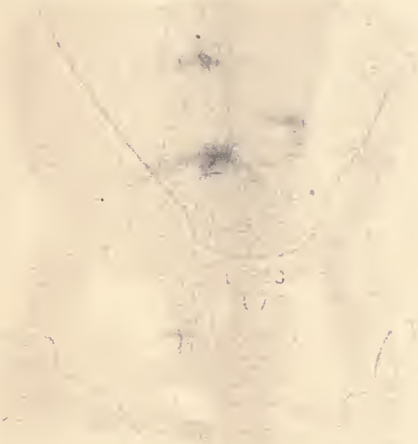
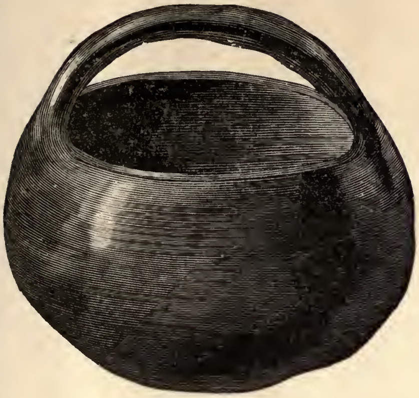
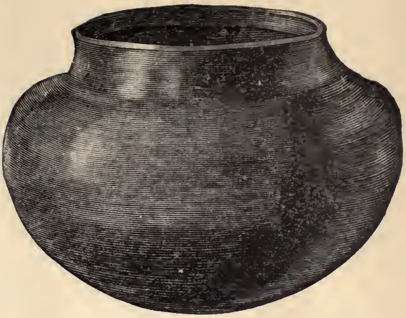


Plate III.



39615
($\frac{1}{2}$)



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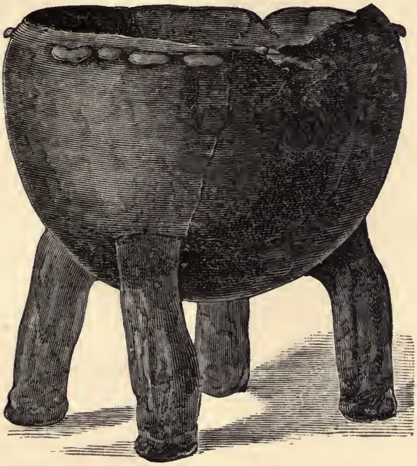
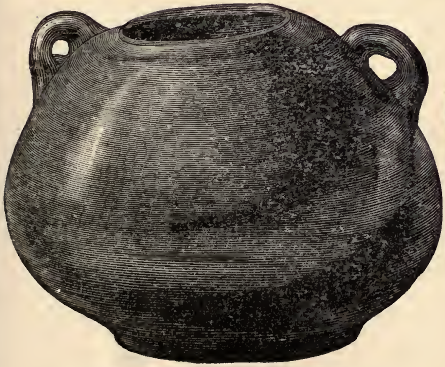


41053
($\frac{1}{4}$)



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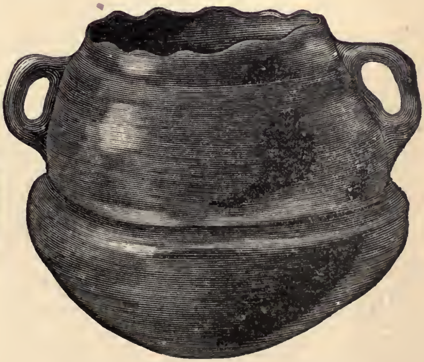
($\frac{1}{2}$)



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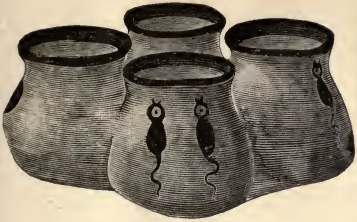

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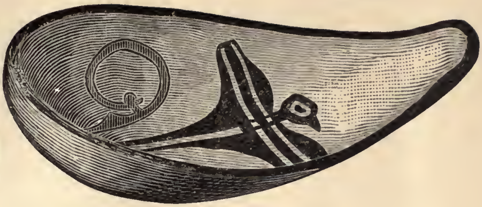

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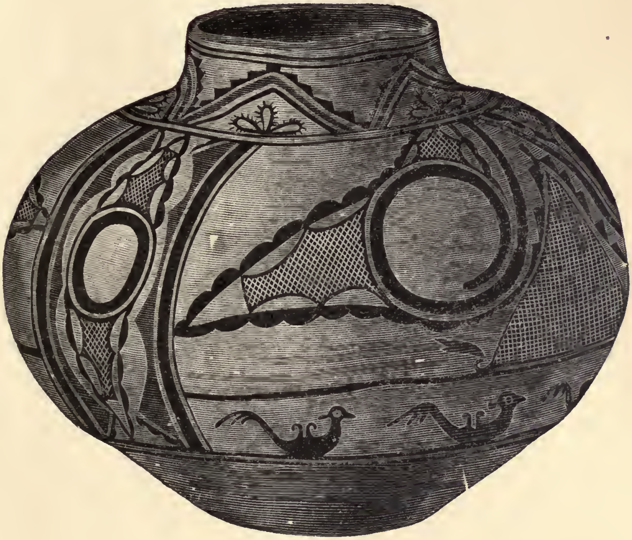

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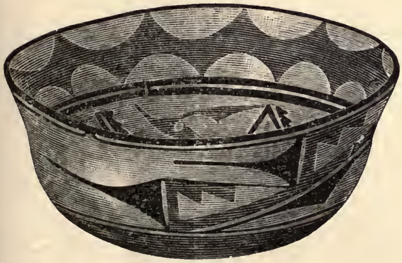

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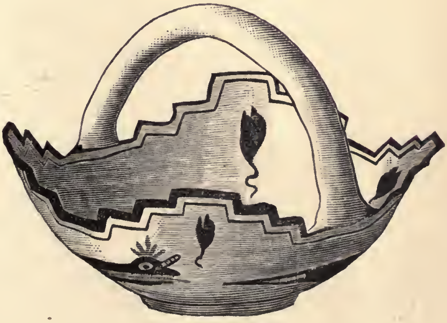

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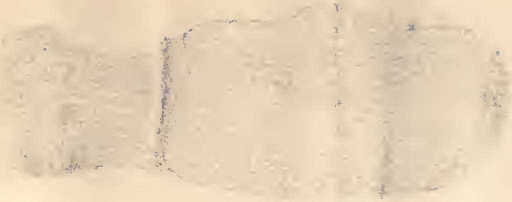

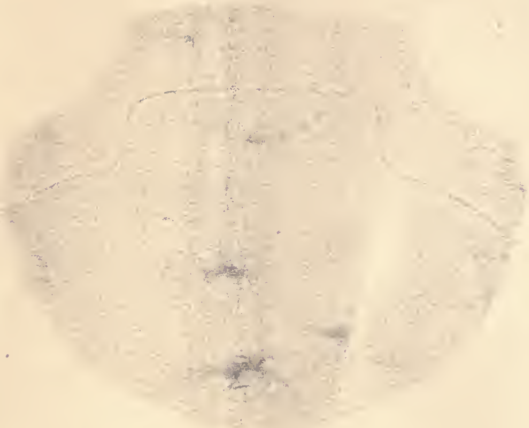

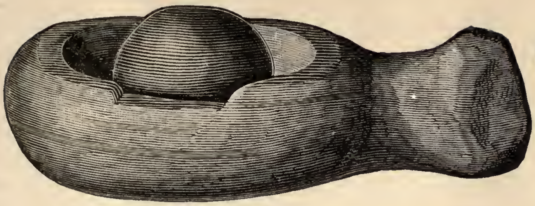

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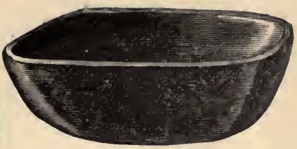
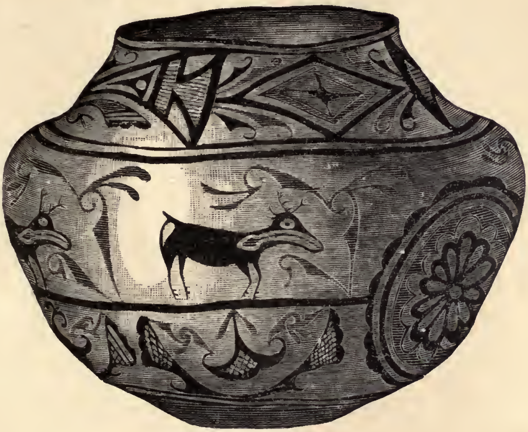
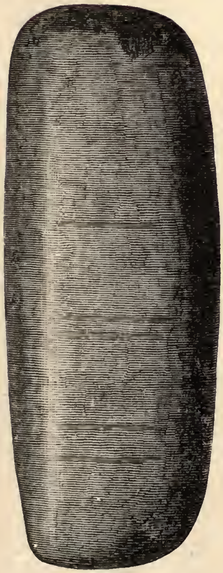
($\frac{1}{3}$)



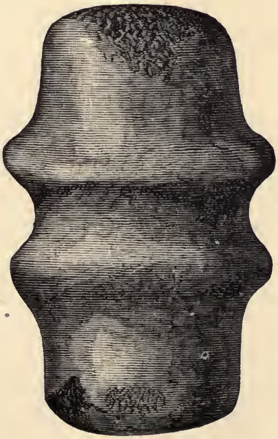
39695
($\frac{1}{2}$)



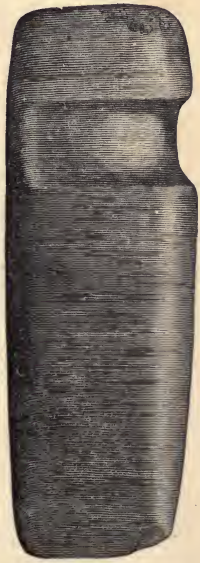
40317.
($\frac{1}{5}$)



42208
($\frac{1}{3}$)



42337
($\frac{1}{3}$)



40560
$\frac{1}{3}$